18: The Normal Distribution

Stat 120 | Fall 2025

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Suppose weights of newborn babies in one community are normally distributed with a mean of 7.7 pounds and a standard deviation of 1.25 pounds

1. Use the 95% rule to sketch a graph of this normal density curve. Include a scale with at least three values on the horizontal axis.

2. Suppose I wanted to know the percent of newborns weighing less than 4.5 pounds.

(a) Use StatKey to answer this question
(b) Use the `pnorm` function to answer this question.

Answer: _____

3. Suppose I wanted to know the 15th percentile of the distribution.

(a) Use StatKey to answer this question
(b) Use the `qnorm` function to answer this question.

Answer: _____

4. APM Research Lab ran a survey of likely Minnesota voters between Sept 16-18 of this year. Here's an excerpt from their methodology report:

> *The margin for error, according to standards customarily used by statisticians, is no more than ± 3.5 percentage points. This means that there is a 95% probability that the "true" figure would fall within that range if all voters were surveyed. The margin for error is higher for any subgroup, such as a gender or age grouping.*

They reported 48.4% in support of the Harris/Walz ticket, and 43.3% in support of the Trump/Vance ticket.

(a) How do you feel about this summary of a confidence interval (for a public/non-statistician audience)?

(b) What is the standard error for each of these estimates?

(c) Build a 95% confidence interval for one of these proportions

(d) Use the normal distribution to instead build a 99% confidence interval for one of these proportions

The report also says:

> *Overall margin of error = 3.5 percentage points (and therefore approximately 7 percentage points for the difference between two data points)*

(d) Use this information to build a 90% confidence interval for the *difference in proportions* between the Harris/Walz supporters and the Trump/Vance supporters.

5. True or False?

(a) The central limit theorem says that the population distribution is approximately normal if the population is big enough.

(b) The central limit theorem says that the sampling distribution for the mean of a random sample is approximately normal if the sample is big enough.

(c) The central limit theorem says that the sampling distribution for the mean is only normal if the population distribution is normal.

(d) The central limit theorem says that any statistic is normally distributed if the sample size is big enough.

(e) The central limit theorem applies to proportions and means

5. Using `pnorm` or `qnorm`, find the following quantities.

(a) $P(Z < .25)$

(b) $P(Z > 1.5)$

(c) $P(-.5 < Z < 1.5)$

(d) z^* where $P(Z < z^*) = .33$

(e) z^* where $P(Z > z^*) = .33$

(f) $P(X < 10)$ where $X \sim N(15, 22)$

(g) $P(X > 40)$ where $X \sim (15, 22)$